

CLAIMS

1. A compressor (10) with an adjustable diffuser (30), the compressor (10) comprising:

a compressor wheel housing (14) defining an inlet (24) for receiving a gas;

a diffuser (30) extending circumferentially around the compressor wheel housing (14) and defining a fluid passage (32) connected to the housing (14) and configured to receive the gas from the housing (14), the diffuser (30) having an inner surface (34) at least partially defining the passage and the diffuser (30) defining a fluid port (40) configured to receive a control fluid;

a volute (26) fluidly connected to the diffuser (30) and configured to receive the gas from the housing (14) via the diffuser (30);

a rotatable compressor wheel (12) disposed in the housing (14), the wheel (12) being configured to rotate and thereby compress the gas and deliver the gas to the volute (26) via the diffuser (30);

an adjustable diffuser wall (36) disposed in the diffuser (30), the diffuser wall (36) extending circumferentially in the diffuser (30) and defining first and second sides (38,39), the first side (38) being disposed toward the inner surface (34) of the diffuser (30) and the second side (39) being in communication with the fluid port (40) of the diffuser (30); and

a deformable diaphragm (44) configured to connect the diffuser (30) and the adjustable diffuser wall (36), the diaphragm (44) being structured to be deformed by the control fluid such that the adjustable diffuser wall (36) is adjustable between first and second positions according to a pressure of the control fluid, the inner surface (34) of the diffuser (30) and the adjustable diffuser wall (36) in the first position defining a first gap therebetween, and the inner surface of the diffuser (30) and the adjustable diffuser wall (36) in the second position defining a second gap therebetween, the second gap being larger than the first gap.

2. A compressor (10) according to Claim 1 wherein the diaphragm (44) is structured to substantially seal the control fluid from the passage (32) of the diffuser (30).

3. A compressor (10) according to Claim 1 wherein the diaphragm (44) extends circumferentially in the diffuser (30) and defines radially inner and outer peripheral portions (50,52), at least one of the peripheral portions (50,52) being connected to the diffuser (30).
4. A compressor (10) according to Claim 1 wherein the inner and outer peripheral portions (50,52) of the diaphragm (44) are connected to the diffuser (30).
5. A compressor (10) according to Claim 1 further comprising at least one seal (60,62) disposed between the adjustable diffuser wall (36) and the diffuser (30), the seal (60,62) substantially fluidly disconnecting the fluid port (40) from the passage (32) of the diffuser (30).
6. A compressor (10) according to Claim 1 further comprising at least one stop (58,59) disposed between the adjustable diffuser wall (36) and the diffuser (30) and configured to limit the movement of the adjustable diffuser wall (36) in the diffuser (30).
7. A compressor (10) according to Claim 1 wherein the fluid port (40) is connected to a valve (70) configured to selectively fluidly connect the fluid port (40) to first and second fluid sources (72,74).
8. A compressor (10) according to Claim 7 wherein the valve (70) is configured to selectively fluidly connect the fluid port (40) to the volute (26) and an ambient pressure source.
9. An adjustable diffuser (30) providing a fluid passage (32) between a compressor housing (14) and a volute (26), the adjustable diffuser (30) comprising:
a diffuser body extending circumferentially around the compressor housing (14) and defining a fluid passage (32) connecting the housing (14) and the volute (26), the diffuser body having an inner surface (34) at least partially defining the passage (32) and

the diffuser body defining a fluid port (40) configured to receive a control fluid;
an adjustable diffuser wall (36) disposed in the diffuser body, the diffuser wall (36) extending circumferentially in the diffuser body and defining first and second sides (38,39), the first side (38) being disposed toward the inner surface (34) of the diffuser body and the second side (39) being in communication with the fluid port (40); and
a deformable diaphragm (44) configured to connect the diffuser body and the adjustable diffuser wall (36),
wherein the diaphragm (44) is structured to be deformed by the control fluid such that the adjustable diffuser wall (36) is adjustable between first and second positions according to a pressure of the control fluid, the inner surface (34) of the diffuser body and the adjustable diffuser wall (36) in the first position defining a first gap therebetween, and the inner surface (34) of the diffuser body and the adjustable diffuser wall (36) in the second position defining a second gap therebetween, the second gap being larger than the first gap.

10. An adjustable diffuser (30) according to Claim 9 wherein the diaphragm (44) is structured to substantially seal the control fluid from the passage (32) of the diffuser body.

11. An adjustable diffuser (30) according to Claim 9 wherein the diaphragm (44) extends circumferentially in the diffuser body and defines radially inner and outer peripheral portions (50,52), at least one of the peripheral portions (50,52) being connected to the diffuser body.

12. An adjustable diffuser (30) according to Claim 9 wherein the inner and outer peripheral portions (50,52) of the diaphragm (44) are connected to the diffuser body.

13. An adjustable diffuser (30) according to Claim 9 further comprising at least one seal (60,62) disposed between the adjustable diffuser wall (36) and the diffuser body, the

seal (60,62) substantially fluidly disconnecting the fluid port (40) from the passage (32) of the diffuser body.

14. An adjustable diffuser (30) according to Claim 9 further comprising at least one stop (58,59) disposed between the adjustable diffuser wall (36) and the diffuser body and configured to limit the movement of the adjustable diffuser wall (36) in the diffuser body.

15. An adjustable diffuser (30) according to Claim 9 wherein the fluid port (40) is connected to a valve (70) configured to selectively fluidly connect the fluid port (40) to first and second fluid sources (72,74).

16. An adjustable diffuser (30) according to Claim 15 wherein the valve (70) is configured to selectively fluidly connect the fluid port (40) to the volute (26) and an ambient pressure source.

17. A method of adjusting a diffuser (30) providing a fluid passage (32) between a compressor housing (14) and a volute (26), the method comprising:

delivering a compressed gas from the compressor housing (14) to the volute (26) via a passage (32) of the diffuser (30), the passage (32) being defined between an inner surface (34) of the diffuser (30) and an adjustable diffuser wall (36);

providing a first control fluid through a port (40) in the diffuser (30) to the adjustable diffuser wall (36), the first control fluid having a pressure higher than a pressure of the gas in the passage (32), and thereby adjusting the adjustable diffuser wall (36) toward the inner surface (34) to reduce a cross-sectional size of the passage (32); and

providing a second control fluid through the port (40) in the diffuser (30) to the adjustable diffuser wall (36), the second control fluid having a pressure less than the pressure of the gas in the passage (32), and thereby adjusting the adjustable diffuser wall (36) away from the inner surface (34) to increase the cross-sectional size of the passage (32).

18. A method according to Claim 17 wherein said delivering step comprises rotating a compressor wheel (12) in the compressor housing (14), the compressor wheel (12) delivering the gas radially outward through the diffuser (30) to the volute (26).
19. A method according to Claim 17 wherein said providing steps comprise adjusting the adjustable diffuser wall (36) and deforming a diaphragm (44) connecting the adjustable diffuser wall (36) to a body of the diffuser (30).
20. A method according to Claim 17 wherein said providing steps comprise adjusting the adjustable diffuser wall (36) relative a body of the diffuser (30) and contacting at least one stop (58,59) connected to the adjustable diffuser wall (36) with the body, the at least one stop (58,59) thereby limiting adjustment of the adjustable diffuser wall (36).
21. A method according to Claim 17 further comprising selectively adjusting a valve (70) fluidly connected to the port (40) and thereby providing the control fluids to the adjustable diffuser wall (36).
22. A method according to Claim 17 wherein said first providing step comprises fluidly connecting the fluid port (40) to the volute (26).
23. A method according to Claim 17 wherein said second providing step comprises fluidly connecting the fluid port (40) to an ambient pressure source.
24. A method according to Claim 17 further comprising selectively performing said first and second providing steps according to at least one operating parameter of the compressor (10) and thereby extending an operating range of the compressor (10).